UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
RESEARCH AND DEVELOPMENT

The U.S. Environmental Protection Agency's (EPA) success is dependent, in large part, on our ability to make credible environmental decisions based on solid scientific and technical information. EPA's Office of Research and Development (ORD) is dedicated to developing quality science that is supportive of the Agency's mission and makes an impact on decision-making. ORD has produced this Research Accomplishments Report to inform stakeholders and the interested public of the significant research that was accomplished during the period 1999 through 2001. It is not meant to provide an exhaustive list of our work, but rather to acquaint you with the broad range of meaningful scientific and technical contributions that are produced by the Agency's research laboratories and centers.

We are particularly proud of the expertise and personal commitment that ORD's scientists, engineers, and administrative personnel bring to addressing the environmental challenges of today and tomorrow. ORD's researchers continue to be on the leading edge of scientific inquiry - expanding our nation's scientific knowledge about the environment, developing guidance for assessing both human and ecological risks, devising new technologies and risk management approaches to both prevent and mitigate pollution, and providing technical assistance to those working to protect our environment. All of our work is guided by sound scientific principles, including independent peer review, to ensure that our contributions are consistently of the highest quality.

I hope that you will take the time to read about EPA's efforts to better understand the complex scientific and technical issues facing our nation's environment in this new century. We in ORD remain committed to applying our creativity and technical expertise in helping the Agency meet its vital mission of protecting public health and the environment.

Paul Gilman, Ph.D.
Assistant Administrator

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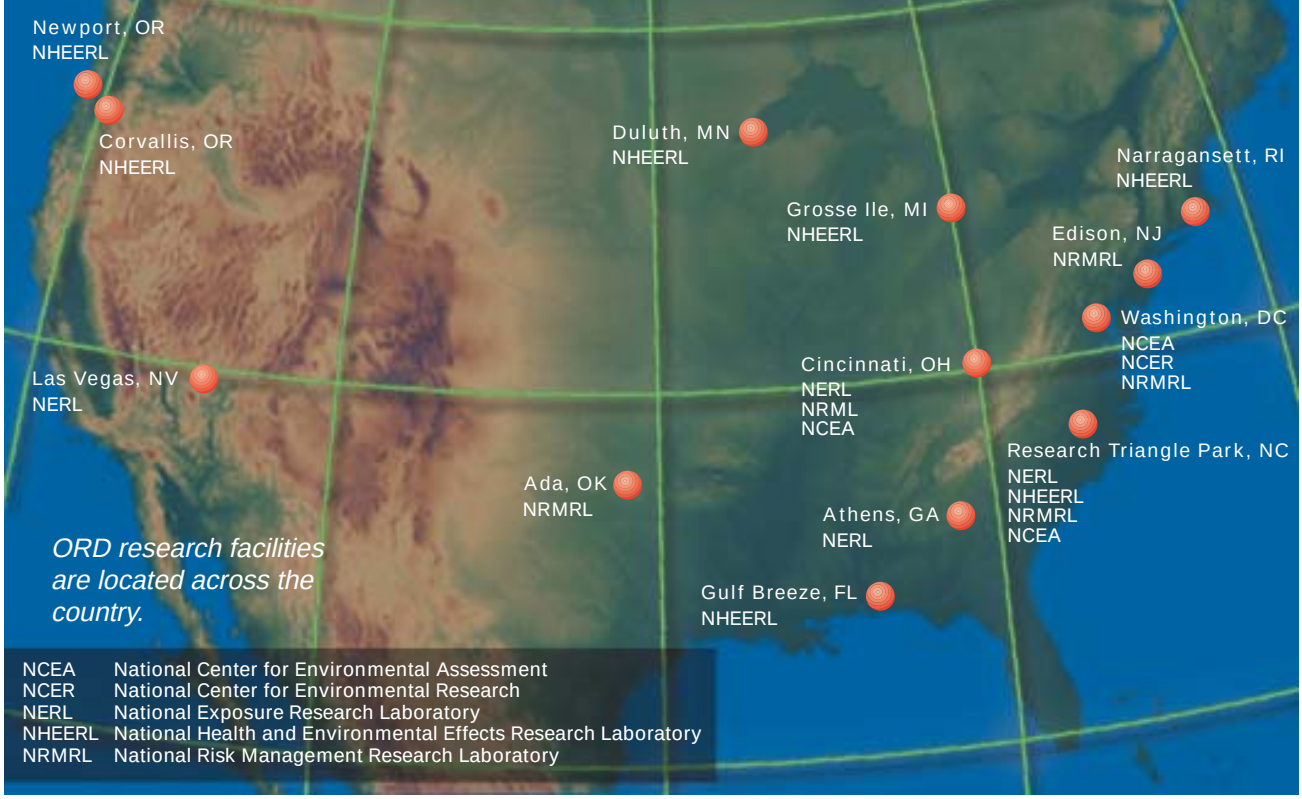
Introduction

The mission of the U.S. Environmental Protection Agency (EPA) is to protect human health and to safeguard the air, water, and land upon which life depends. The Office of Research and Development (ORD), EPA's principal scientific and research arm, conducts research to provide the best available scientific information for environmental decision making. ORD's mission is to conduct leading-edge research and foster the sound use of science and technology to fulfill EPA's mission.

THE RISK PARADIGM

ORD's research program is organized around the "risk paradigm," which consists of two interrelated phases, risk assessment and risk management. Risk assessment is the process used to evaluate the degree and probability of harm to human health and the environment from such stressors as pollution or habitat loss. The risk assessment process consists of exposure assessment, hazard identification, dose-response assessment, and risk characterization. Risk



management involves determining whether and how risks from stressors should be managed or reduced. It is based on the risk assessment findings and public health, social, economic and other factors. Risk management options include pollution prevention and/or control technologies to reduce or eliminate the pollutant or other stressor in the environment.

ORD RESEARCH

The nature of ORD research is ongoing; individual projects provide small but important pieces of larger puzzles, and subsequent projects build on earlier work. Therefore, research "accomplishments" include initiation of long-term research programs and intermediate milestones that are reached along the way to major organizational goals. While by no means all-inclusive, the research highlighted in this document illustrates our recent key accomplishments.

The organization of this report is based on the high-priority research areas identified in the *1997 Update to ORD's Strategic Plan*. The six highest priority areas are safe drinking water, high-priority air pollutants, emerging environmental issues, ecosystem risk assessment, human health risk assessment, and pollution prevention and new technologies. Other important areas of research at ORD are global change, ecosystem water quality, tropospheric ozone, air toxics, environmental monitoring, contaminated sites, and exposures to pesticides and toxic substances. Research accomplishments from all these areas are incorporated into the chapters of this report.

ORD LABORATORIES AND CENTERS

ORD is organized into three national laboratories and two national centers located in facilities around the country, with headquarters in Washington, DC. All ORD labs and centers provide information and technical support to, and collaborate with, EPA Program Offices, Regions, state/municipal/tribal governments, and other agencies performing environmental

research, assessment, and risk management. ORD scientists also collaborate with private-sector partners to address specific environmental issues.

The National Exposure Research Laboratory (NERL) provides information and tools to reduce the uncertainty in EPA's exposure and risk assessments for factors that stress the environment, including chemicals, living organisms, radiation, changes in land and water use, and changes in climate. NERL also evaluates innovative exposure assessment technologies and provides information on stressor sources, pollutant transport and fate, and human exposure to pollutants.

The National Health and Environmental Effects Research Laboratory (NHEERL) is EPA's focal point for scientific research on the effects of contaminants and environmental stressors on human health and ecosystem integrity. NHEERL's research is used by EPA and other government agencies to identify and understand the processes that affect our health and environment, as well as to evaluate the risks that pollution poses to humans and ecosystems.

The National Risk Management Research Laboratory (NRMRL) conducts research on the means to prevent and reduce risks from pollution that threaten human health and the environment. NRMRL investigates methods for prevention and control of pollution to air, land, and water; protection of water quality in public water systems; cleanup of contaminated sites, sediments, and groundwater; prevention and control of indoor air pollution; and restoration of ecosystems.

The National Center for Environmental Assessment (NCEA) is EPA's national resource center for human health and ecological risk assessment. NCEA develops risk assessments, conducts research to improve the science of risk assessment, and provides guidance and support to risk assessors. NCEA functions as a critical link between researchers and EPA decision makers.

The National Center for Environmental Research (NCER) supports leading-edge environmental research by scientists in the academic community. NCER's Science to Achieve Results (STAR) program funds competitive research grants and graduate fellowships in numerous environmental science and engineering disciplines to complement ORD's in-house research. Through this same competitive process, NCER periodically establishes research centers at academic institutions to address specific topics of national concern.

ORD's Science To Achieve Results (STAR) program awards grants to scientists at universities and nonprofit research centers who conduct research on environmental issues specified by EPA. In this manner, EPA has direct access to the best scientists in the country.